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IMPACT OF CLIMATE CHANGE ON COASTAL COMMUNITIES OF SINDH, PAKISTAN - A DESCRIPTIVE CASE STUDY OF DISTRICTS THATTA AND BADIN[i]

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Abstract:

The core purpose of study was to generate evidences to design strategy and objectives for a community development project. The project was funded by German Red Cross with the financial support of BMZ is implementing 'Integrated rural food security in Sindh'. Project was designed for Thatta and Badin Districts of Sindh Pakistan. The Pakistan Red Crescent Society (PRCS) Sindh branch is the implementing partner in the field. The core purpose of project was *"To contribute towards improved resilience of communities in Sindh to disasters and the effects of climate change"* with specific objective *"Capacities for Disaster Risk Reduction and Climate Sensitive Livelihoods are enhanced among Badin and Thatta communities and the respective PRCS District branches in Sindh"*.

It was decided to obtain a descriptive and qualitative information from communities. For that purpose PRA techniques were used for data collection at village level. Criterion purpose sampling method was used in selection of villages because the study was operational in nature.

Two major threats to the livelihood of people were found, left bank outfall drain and climate change. Left bank outfall drain for seepage and industrial wastewater is not constructed as per approved map and due to little flow of Indus River's water in delta sea level is increasing. When sea level raise, while high tide in moon nights water flows back in drain that harm crops nearby because the walls of drain also do not have stone pitching. Due to climate change, seasonal calendar and cropping is also changed for a month, cotton is being cultivated in month of May and harvested in August. Previously

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the calendar was like, cultivation in June and Harvest in September. August is considered as the month of monsoon rain and rain is harmful for cotton crop. Ultimately, due to change in weather is causing continuous damage of only cash crop of area. At the end, the study has suggested some disaster resilient agricultural approaches to be used to overcome the climate change and sea incursion.

Keywords: rural food security, climate change, Sindh, alternative livelihoods, targeted communities

Abbreviations

PRC = Pakistan Red Crescent
GRC = German Red Crescent
SAFWCO = Sindh Agriculture and Forest Workers Coordinating Organization
NRSP = National Rural Support Program
NRM = National Rural Management
TORs = Terms of References
PRA = Participatory Rural Appraisal
FGD = Focused Group Discussion
LBOD = Left Bank Out fall Drain
NGO = Non-Government Organization
KG = Kilo Gram
PKR = Pakistani Rupees
SWOT = Strength, Weakness, Opportunities, and Threats
PESTEL = Political, Economic, Social, Technological, Environmental and Legal

Rural food security = rural communities in Sindh generally grow staple foods in fields and they do not have purchasing power. So, the rural food security is linked with security of agriculture and crops.

Climate change = in this study this term is specifically used for change in seasonal and cropping calendar.

Sindh = it is province of Pakistan that is situated in south, the only province having big sea and delta at the end. It is second large province of county in population and first in terms of production.

Alternative livelihoods = this term has contextual relevance; it refers to the suggestions for any other livelihoods for communities.

Targeted communities = here it refers to the villages those were selected for implementation of project.

1. Introduction

The proposed assignment is designed as per discussions with German Red Cross management and Sindh Agriculture University Focal person in order to build collaboration to provide technical assistance for the successful achievement of the project activities.

The Participatory Rural Appraisal (PRA) activity was proposed under the project in order to determine the alternative livelihoods resilient to disaster and climate change effects that are also appropriate to the local realities. The PRA approach was decided in order to get real picture of the ground realities with the help of targeted communities, document existing coping strategies and climate change adaptation approaches that the targeted communities have already adopted by their own and find out areas where communities propose to be supported in order to design their livelihoods resilient and in line with climate change adaptation theory.

The findings of the PRA study will help in formulation of appropriate climate change adaptation plan for identified major livelihoods in the area and action plan for achieving resilient livelihood systems in the area.

2. Objectives of study

- Social and resource mapping of the targeted communities in order to understand social set up of the communities and understand perception of communities about various resources and its use
- Understanding the perception of communities regarding wealth differences and inequalities in the community and understand community perception about well-being
- To understand about changes in livelihoods over the year and to show the gender-specific seasonality of agricultural and non-agricultural work load and food availability
- To understand pattern of income and expenditure (gender-specific) and control over the resources
- To record community understanding on climate change and disaster risk reduction
- To document existing coping strategies of communities to climate change adaptation and prepare climate change adaptation plan for identified livelihoods

3. Methodology

3.1 Type of study

The proposed study is descriptive in nature that aims to describe the impacts of climate change on communities of costal area in their own viewpoint. In the aspect of design and sampling, the study is operational because it aims to set the benchmarks or baseline for a specified project on climate change and livelihoods as defined under introduction.

3.2 Sampling

As the targeted respondents of research are pre-defined, those would be the communities where project will be improved, so the purposive sampling is proposed for the study. Further, the targeted communities are selected against some criteria and same criteria will be used for selecting sampling, so the sampling could be further specified as criterion purposive sampling.

3.3 Method of data collection

Data will be collected from primary sources (communities) and secondary sources (government departments). For both of the sources different data collections tools will be used. For communities we will be using PRA tools and for government we will use PESTEL/SWOT analysis.

3.4 Data collection tools

- Social mapping (with communities)
- Resource mapping =
- Wealth ranking =
- Seasonal calendar =
- Income and expenditure matrix =
- Resource Cards =
- FGDs =
- PESTEL/SWOT analysis (with government departments)

3.4 PRA design

As per the nature of data collections tools our sample will be villages rather individuals, total 10 villages will be visited (5 from district Thatta and 5 from district Badin). Further, it will be ensured that at least 50% of the households of each selected village participate in the PRA activities in order to record the real picture of the area.

For PESTEL/SWOT analysis with government departments for secondary data, we will conduct one activity at one district. The activity will be like a group work by participants that will take at least three hours at morning time. The team of officials will be divided in to groups each group will have to see the PESTEL in context of SWOT. The sample table is given below for understanding.

Analyse the context for existing livelihoods at district level using following table:

Context	Analysis			
P=Political	S=Strength	W=Weakness	O=Opportunities	T=Threats
E=Economic				
S=Social				
T=Technological				
E=Environmental				
L=Legal				

3.5 Definition of PRA tools

3.5.1 Social mapping

This refers to draw the map of social structure of village. A social structure refers to anything existing in village that has a social importance or place. For example, houses, roads, hand pumps, crops, shops, any religious building (mosques, churches, temples so on) or any other social thing.

3.5.2 Resource mapping

Resource mapping is similarly to list down or sort the all economic or social resource owned by community. Resource mapping means mapping of resource in relation to the project to identify what community already have and what it actually needs.

3.5.3 Wealth ranking

This refers to the all of economic resource owned by community, such as, agriculture, livestock or any other property. By wealth, we mean any type of capital or other assets that community have in their hand.

3.5.4 Seasonal calendar

This is to map all of the seasons in terms of months, highlighting related crops or livelihood resources in each season.

3.5.5 Income and expenditure matrix

This is the analysis of income and expenditure of villagers to understand overall economic potential of community.

3.5.6 Resource Cards

This activity is particularly done to show the ownership of all economic resources shown in wealth ranking or resource mapping (gender dimensions).

4. Analysis of PRA findings

4.1 Social Mapping

For social mapping different sorts of colors were used to draw the map and identify important structures, livelihoods and hazards in the targeted villages (See Fig-1 below). This activity was done with male members of community only due to cultural restrictions for co-gatherings in the area. Different shapes and colors were used to identify different places in the villages.

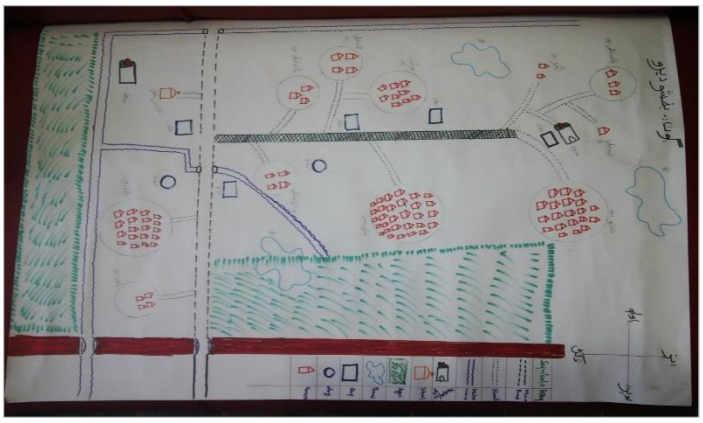

Figure 1: Social map

In all of the PRA villages, household settlements were found surrounded with agriculture land and water channels. Population was scattered in both of the districts, however Badin District is shown more scattered as compare to Thatta. The average distance among villages in district Badin found 10 to 15 KM, whereas in district Thatta it was recorded as 5 to 10 KM. Overall villages are very small like hamlets, average number of households in Badin was 100 per village, whereas average 135 households were recorded in Thatta. Village numbers of households as told by the targeted villagers is given in table-1.

Table 1: Average village size (HHs)

District	UC	Village	Households
Badin	Bhugira Memon	Abdul Haq	100
Badin	Bhugira Memon	Bakhisho Dero	125
Badin	Dodo Soomro	Khamo Mallah	50
Badin	Bedhmi	Haji Khan Khaskhali	100
Badin	Serani	Soomar Mallah	125
Thatta	Keti Bunder	Haji Noor Ahmed Jat	125
Thatta	Keti Bunder	Jafar Mughal	150
Thatta	Keti Bunder	Yar Muhammad Sholani	100
Thatta	Keti Bunder	Qasim Khaskheli	50
Thatta	Buhara	Misri Mallah	250

Mix up of ethnic groups or communities were in all of the villages in both of the districts, the most frequent communities were, Mallah, Khaskheli, Dal, Bhati, Sholani and Jat. No any other religious community other than Muslim was found in the selected ten villages.

Religious buildings such as mosques were found in each village. Apart of religious institution, no any other institution was visibly functional in the villages. Education institution such as, schools found in six out of these ten villages. Many school buildings are available but these are not functional, school buildings are used for public gatherings or not in use at all. No any government health facility is available in the villages in both of the districts; however, a private dispensary was found in a village in district Thatta that was established by a local NGO.

Agriculture is usually under threat in both of the districts since years mostly in district Badin. The strong hazards found in villages of district Badin was, left bank out fall drain (LBOD) canal. The actual design and route of LBOD was planned inside the natural path of Indus water during flood days. But, during construction, that route was changed from the agriculture lands of communities and that project of million rupees in now billion rupees threat to local people and agriculture land of Badin. The social dynamics of villages are almost similar; one illustration of social map is given below. The red line in the below map is showing the hazard, that hazard is LBOD running near by the village among agriculture fields. The LBOD has beaten the health, shelter and crops of villagers for three times since 2010.

4.2 Resource Mapping

Only three categories of resources found in villages, Land, Livestock and Fisheries (LLF). Nearly every village has these all of the resources. However there is no equal access to the land, most of the communities are sharecroppers. Landlords usually do

not live in the respective villages; they live in the nearest towns/ cities. Average land size with a sharecropping family is about 5 to 10 Acers on which he cultivates mix of food and cash crops. However, fishing is free for every fisherman who possesses the license for fishing. Some of the fisherman of the targeted villages go to deep sea for fishing and stay there for around 15 days in the sea. The local fisherman communities have not personal boats to do fishing in the deep sea so; they work with the contractors/ middlemen.

Women usually work in agriculture fields and also keep livestock but these are not involved in fishing, they avoid to stay in water and fishing for continuous 15 days or long. Although women of the family are equal contributor in the livelihood activities of the family however, all the financial matters are dealt solely by the male members of the family which indicates towards gender related dimensions in the area.

Decision making in livestock is usually done by the people who possess it, however the decision about cropping and agriculture is done by the landowner and the sharecroppers have to follow. If, landlord feel that there is no business in rice cultivation then he/she can order to stop rice harvesting and farmer family may suffer for food. The decision regarding fishing is trigonal, at one hand it is Government to provide fishing license, at other end fisherman after getting license is free and fishing contractor has also power to make decisions. Fishermen are not usually in loss because it is a different type of job and they are skilled in it, contractors do need them.

Water and fuel is available in all of the villages, usually it is the duty of women to collect water and fuel (firewood) for household. There are no such grazing lands for livestock, keeping livestock usually depends on agricultural land.

4.3 Wealth ranking

4.3.1 Definition of wealth ranking

Unlike in urban centers, in rural areas wealth is not considered in terms of money or coins (See Table-2). As per people's perception, wealth is ownership of land and livestock, fishing is also not considered as wealth because this is a daily earning job, a fisherman doesn't own anything. It was found in discussion and practical exercise that for communities' wealth is something you have in hands for ever or for long time and you can earn form it. In the terms of economics this may be called as capital goods, at local level the capital goods are land and livestock because these can produce money without losing own economic value.

Table 2: Definition of wealth groups

District	Names of Villages	Wealth group			
		Very Poor	Poor	Middle	Better off
Badin	Bhugira Memon Bhugira Memon Dodo Soomro Bedhmi Serani	• No land ownership • Share cropping (5 acre) • No big livestock (Cows/Buffalos) • Keep shared cows and/or buffalos (maximum two) • Two goats and/or sheep • Casual labor • Maximum two earners in household • Average family size = 6 • Dependency ratio 2:6	• Own two to five acres of land • Own two buffalos and/or cows • Own two to three goats and/or sheep • Maximum two earners in family • Average family size = 6 • Dependency ratio 2:6	• Own 5 to 10 acres of land • Own three to six cows and/or buffalos • Own 5 to 10 goats/ sheep • Maximum three earners in family • Average family size =6 • Dependency ratio 3:6	• Own more than 10 acres of land • Own more than 6 cows/ buffalos • Own more than ten goats and/or sheep • Maximum 4 earners in family • Average family size = 6 • Dependency ratio 4:6
Thatta	Keti Bunder Keti Bunder Keti Bunder Keti Bunder Buhara	• No land ownership • Share cropping (5 acre) • No big livestock (Cows/Buffalos) • Keep shared cows and/or buffalos (maximum two) • Two goats and/or sheep • Casual labor • Maximum two earners in household • Average family size = 7 • Dependency ratio 2/7	• Own two to five acres of land • Own two buffalos and/or cows • Own two to three goats and/or sheep • Maximum two earners in family • Average family size = 7 • Dependency ratio 2/7	• Own 5 to 10 acres of land • Own three to six cows and/or buffalos • Own 5 to 10 goats/ sheep • Maximum three earners in family • Average family size = 7 • Dependency ratio 3/7	• Own more than 10 acres of land • Own more than 6 cows/ buffalos • Own more than ten goats and/or sheep • Maximum 4 earners in family • Average family size = 7 • Dependency ratio 4/7

4.3.2 Summary of wealth group

After analysis of wealth and wellbeing perceptions of community, wealth ranking and problems analysis was done according to socioeconomic groups, socioeconomic groups were formed according to types of livelihoods (See Fig-2 below) . Generally there are three livelihood groups, agriculture, livestock and fisheries. Most of the households depend on dual livelihood sources such as, fishing + livestock and agriculture + livestock; livestock is secondary livelihood for both agriculture and fishing groups. Wealth ranking is done against each livelihood group separately.

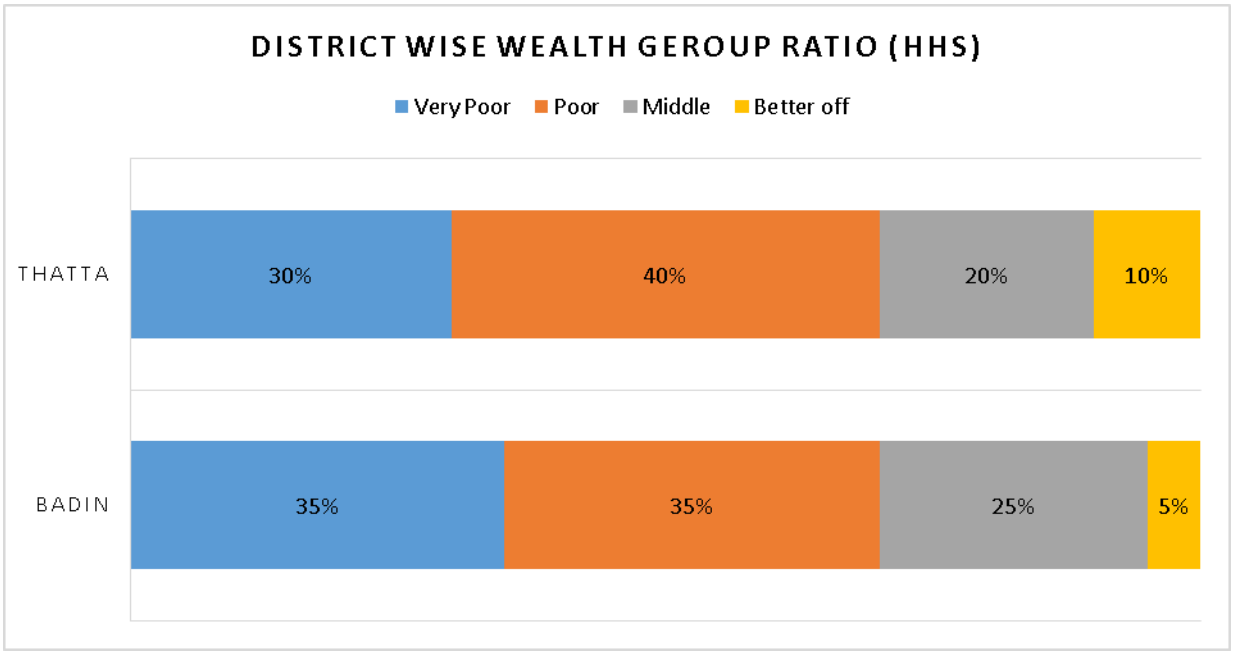

Figure 2: District wise wealth group ratio

4.3.3 Agriculture

Agriculture, is most strong source of livelihood, communities not only get cash money from agriculture but also take food stock for consumption. There are three major crops cultivated in a year, wheat, rice and cotton. Wheat and rice generally are not considered as cash crop, wheat is mostly used for food, however little amount of rice is being sold by people. If calculate the amount of wheat and rice consumed and add it with amount of cash generated from cotton, on average each sharecropping family earns 200,000 rupees from agriculture in cash and kind. No any other livelihood group can earn such amount during year. But, there are many problems faced by farmers during year which make them unstable forever. Cotton is only cash crop which is harvested in July and August, it was found during seasonal calendar that frequent disasters, like, rain floods or heavy storm come during these months (July and August). Due to frequent rain/ floods in 2011, 2013 and 2015, cotton was the most affected crop in the targeted area. Frequent harm to only cash crop (cotton) of area, people are economically suffering since years. People do not have cash to invest on other crops and over all agriculture cycle is suffering; farmers are continuously under burden of debts. In district Thatta, April and May are the dry months, when there is no water in water channels until the monsoon starts in upper areas of the country. In district Badin, May and June are dry months. Due these dry months, cultivation of rice starts after monsoon in the months of July and August and harvested in the months of October, November and December. Due to late harvest of rice crop, sowing of wheat gets late. These late cultivations effect on the yield of both crops, to avoid this low yield hybrid seeds are used which cost

more due to more input application. The existing farming and sharecropping model has many structural defects which does not favor the sharecroppers but only the land owners. Resulting, no any sharecropper can be found out of debt and no any landlord will be found indebted.

4.3.4 Livestock

Livestock is the most important livelihood source of the majority of the population in the both districts. Climate change and weathers generally have not affected livestock anymore as compare to agriculture. Usually people do not own livestock as source of earning; produced milk is mostly used as household food. People earn from livestock when they sale it, on average one animal (cattle) is sold every year by each livestock family which may earn from 40,000 to 80,000. There is potential within communities to promote livestock and livestock marketing. If we calculate the amount of consumed milk in rupees and add amount of rupees earned by sealing animal, on average, each family earns 125,000 per year. Mostly the people engaged in agriculture do keep livestock, fisher communities also keep livestock but it is difficult for them to arrange fodder. In district Thatta small livestock and poultry is always under threat of contiguous diseases due to many reasons. The strongest reason is unprotected poultry farms. When unprotected poultry form get any viral disease that suddenly spread in small livestock of nearby villages. Mostly women of the family are responsible to arrange the fodder and feeding and take care of the animals at home whereas male members are responsible to ensure the purchases of the fodder in case of shortage of the local fodders.

4.3.5 Fishing

Fishing practice was observed in all of the PRA villages. In two out of ten households, fishing was not source of income; rather it was done at micro level for household food. People used to fish in small ponds of fresh water that is used for household food as well. Fishing is business for people those who fish at big level, especially in deep sea. Two villages in Badin and all of the village in Thatta were found having fishing families, those use fishing as their source of livelihood. In district Thatta fisher communities usually go to Karachi and used to fish one heavy boats of contractors. They people earn 6,000 per head on each sea trip of 15 to 20 days and take rest for one week after each trip. Fisher man in Badin and Thatta those fish on own resources in small water ponds earn 10,000 per months on average. If we pick the middle 8,000 per month, fisher families earn 96,000 to 100,000 per year. Due to costal belt, there is a lot of fishing opportunities but in terms of earning fishing is third most favorite source of

livelihood. Fishing is legally and politically supported profession but it is not economically strong business of area. Because that, at local level rates of fish for fisher folks are not good enough.

4.4 Seasonal Calendar

There are four seasons in a year and every season has it is own cropping conditions as reported in the PRA targeted areas. The busiest season is when cotton is harvested and rice crop is cultivated, just after the monsoon season people harvest cotton and cultivate rice side by side. August, September and October are busiest months of year. Relatively free months of the year are, Jun and July during which livelihood options are reduced and thus, the area witness hunger period. The fishermen are also free during those months because these are reproductive months of fishes and fishing is officially banned during these months, the local fisher have adopted a tradition to not do fishing during those months.

There are usually two types of crops; cereal, oil seeds and cash crops in the area. Rice and wheat are main cereal crops whereas cotton and some limited assorted vegetables are the cash crops in the area. However, sugarcane is also major crop of the area.

For fishermen all the year remain same in term of earning except two months (June and July), for agrarian families there is only one main cash crop that is cotton. In the months of cotton harvesting, generally from July to September farmers do have some cash in hand. Wheat and rice they keep for their household consumption. Overall August, September, December, January, March and April are the months for harvest of different crops, and during these months farmer families do have some amount to pay their debts.

Pattern of rain fall is usually same just delayed for fifteen days as compare to the rain calendar ten years ago. This slight shift of rain pattern has been due to changes in the climate. Generally it rain in the months of monsoon from July to August, these are usually the months for cotton harvesting. So, the falling the rain is not agriculture friendly rather it damages the only cash crop of area (cotton).

As shown in calendar, April and May months are considered dry for both Thatta and Badin districts respectively. During these months, there is no water in channels until the monsoon is started in upper areas and feeds the River Indus. Water shortage can be visible in the both districts in above mentioned months. Due to shortage of water in these months cotton cultivation gets delayed and, ultimately it harvests late when monsoon starts in costal belt in the mid of July to the mid of August.

Women do work more as compare to men, because, they work in land and at home as well. But, usually their work is not as much energy taking as compare to men; details are given in daily calendar below. Men do have equal work in field round the year, women usually support in harvest seasons, for example, rice, wheat and cotton harvesting. It generally took one month to harvest each crop, so, in general women do work in land for three months. Apart from that, women do also arrange fodder for livestock that moves round the year with same labor and intensity. Fishermen those fish locally do work equally for ten months of year except June and July. The fisherman who goes to deep sea does work for fifteen days in a month during ten months of year when fishing is allowed.

Usually people work round the year however the months of June and July are relatively free for agrarian and as well as fishing communities. Women of agrarian families usually get some time during June, July, November, January, February and March, because no any harvesting happens during these months in general. The women of fishermen usually have some time round the year if these are not involved in livestock keeping.

The most hazardous season is summer especially during July and August in the area and winter is comparatively favorable especially for wheat and vegetable growers. For district Badin monsoon floods causes over flow which leads breakage of LBOD which is dangerous for crops, livestock and communities. Two major livelihoods, agriculture and livestock are more under threat in district Badin as compare to district Thatta. Overall, floods, cyclone and drought are the main hazards reported for the PRA targeted area.

It was observed that every crop is one month earlier in district Thatta but Monsoon season is same for both, during the months of July and August. For better understanding, seasonal calendar is given below (page-17):

Table 3: Seasonal Calendar

	Seasons											
	Winter		Spring		Summer						Autumn	
	Months											
Livelihoods	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**
Wheat Sowing												
Wheat Harvesting												
Rice Sowing												
Rice Harvesting												
Cotton Sowing												
Cotton Harvesting												
Deep sea fishing												
Regular pond fishing												
Peak of handicrafts												
On-farm wage labor												
Off-farm wage labor												
Artisans (black smith, hair dresser, tailor)												
Reproduction period of livestock												
Livestock market												
Livestock daisies												
Food scarcity												
Floods												
Cyclone												
Drought												

4.5 Impact of seasonal variation on livelihoods

Winter is the season of rice harvesting and wheat sowing. No any environmental hazards are observed to agriculture and fishing in winter season. It is hard for fishermen to fish in sea during winter, but, fisher folk are trained to face these problems. Livestock needs more care in winter because various diseases outbreak

during this season. Milk production generally goes down with fall in temperatures during this season. Generally, people feel happy with winter because intensity of southern wind goes down; there is no threat of potential disasters during the winter season due to low rains, low temperature and low southern winds.

Spring is the season of wheat harvesting. It is time for daily wage labor to earn their livelihood. Generally, the spring is season of expenditure rather than earning like winter. Just after wheat harvest people get some time and weather is also pleasant, so, mostly cultural festivals and marriage ceremony are frequent during this season in both Badin and Thatta districts. The month of March and April are considered as wedding months since many years in these areas. People also prefer to build their homes in spring seasons, because, they are little free now, they have saved something from wheat crop and season of monsoon is on head. Due to these expenses, people can rarely save some money from wheat crop to invest in cotton sowing. In that situation people cultivate cotton by taking debts.

Summer is not economically favorable for agriculture and fisheries. For livestock, summer is favorable, because, more fodders are available from spring season, and this leads to more milk production in the area. Both supply and demand of milk gets increased during this season. Owned livestock is not economic support, because average livestock population is one cow/buffalo per household, which is enough for self-consumption. In case of heavy floods and over flow of LBOD livestock also gets under threat. Many of the people lost their livestock during the floods of 2011 and they cannot purchase again in Badin district. During summer season which starts from April and ends in October, generally three months are not economically favorable for communities, (June, July and August).

Autumn is transitory period for agriculture economy. Cotton crop is harvested and rice crop is cultivated during 1.5 months of autumn. Generally autumn is considered as dry and fall season. In district Thatta and Badin autumn is considered started from third week of October which continues till fourth week of November. No any visible positive or negative change is observed in any primary livelihood during 1.5 months of autumn.

4.6 Income – Expenditure matrix

Table 4: Income and expenditure analysis

Occupation	Income per month	Expenses per month	Balancing
Agriculture	16,600	18,500	-1900
Daily wage labor	6,500	10,500	-4000
Livestock	10,500	12,500	-2000
Government jobs	20,000	20,800	-800
Fisher folks	8,000	16,500	-8500

As shown in table above income and expenditure of government employees is higher because they are high paid, expenses are also high because the pay for their comforts and frequently travel out of village. There is only 800 rupees over spending for government employees because they know their monthly income and try to spend accordingly. Agriculture communities are little over spent because they produce their own wheat, rice and vegetables. Usually agriculture is the top most livelihood source but due to climate change and frequent disasters, they are always on risk. Since 2011 it is third time, cotton crop is damaged in costal belt due to irregular monsoon. Livestock is the second most important source of livelihood; it can be more productive if can create milk market in villages. Fishing is third most important source of livelihood but due to involvement of big investors, fisher communities usually cannot earn according to their needs.

Figure 3: PRA (alternative livelihoods)

Figure 3 shows the PRA activity in which community is analyzing there alternative livelihood sources. Analysis of population and alternate livelihood sources found that livestock can be good alternative livelihood source. Agriculture and fishing communities do keep livestock, in fisher man families one to two male stay at home when few male of the communities go for fishing in sea and they take care of livestock.

Other alternative livelihood source can be handicrafts which are done by women, 90% of women know handicrafts work but there is no market for handicrafts. By providing sustainable marketing for milk and handicrafts, we will be able to support communities to get out of over spending or under earning. Due to boom in capitalist market or macro economy, micro economy at local level is totally destroyed. We found only one pot maker and two masons in ten villages, there was not black smith at local level. If we have not started working on handicrafts one day it will defeated by capitalist macro economy, such as, big cloth making factories or designer brands. Before capitalists control the market of milk and handicrafts through fortified factory products, we need to promote marketing of both at local level. Otherwise, one day will have no any livestock and handicrafts workers at village level and rural communities will depend on mono economy that will be worst economic situation.

Below tables will provide details of expenses by communities against size of their family. Table-5 and 6 shows the average monthly expenses of communities in district Badin and Thatta respectively. Whereas, table-4, gives consolidated view of average monthly income verses expenditure of communities, according to livelihoods.

It was observed during exercise that income of communities do vary round the year, whereas expenditure remains almost the same. In winter season, people usually spent more on health of their livestock and families. Due to varying income and same expenses, people usually spent over and they are under debts since years. Usually every livelihood group spent money on similar activities, however it was found that government and private employees spent more on travel as compare to other livelihood groups. Well off people such as employees and land owners spent more on clothing and housing as well. Education is free in government schools, if there is no school in village then parents do not take any interest in education of their kids.

People generally do have any economic potential to by any agriculture tools. Fertilizers and pesticides are taken on interest from local shopkeepers. Usually the women and men have similar trend of expenditure in terms of basic needs, however, men spent more on their social activities as compare to the women. The health expenses of women and children are more than the men of the family.

Table 5: Income and expenditure analysis of Badin

Summary of expenses per month in district Badin								
Family size	**Food**	**Health**	**Clothing**	**Social events**	**Education**	**Transport**	**Communication**	**Total**
1-4	5,000	1,000	1,000	500	400	1,000	1,000	9,900
4-8	8,000	2000	2,500	1,000	700	1,800	1,500	17,500
8-16	10,000	2,500	3,000	1,500	1,000	2,000	1,800	21,800
16-22	14,000	3,000	3,500	2,500	1,500	2,500	2000	29,000

As found during participatory rural appraisal, average family size in district Badin is 6. If we refer the table of expenses against size of family as shown above, average monthly expenses of household of 6 family members can be nearly 12,000 PKR per month. If compare it with average monthly income given in table-C, it shows that no any primary livelihood source earns more than 6000 PKR. It has been noted that all of the agriculture households and 50% of the fishing household rear livestock as secondary livelihood source. Milk produced from that livestock is not for sale but it is of average worth of 3000 PKR per month. A fishing+ livestock family earns average 8, 000 PKR per month and agriculture+ livestock family earns average 5,000 PKR per month. This shows that all of the households in village are indebted due to remarkable variation in the income and expenditure. Income of two months is equal to expenses of one month, means all the communities have consumed their future earning and their coming generations will also born under debts. This whole scenario has created the structural debt cycle in the area which does not show any visible end in near future unless any integrated long term livelihood enhancement strategies are not adopted.

Table 6: Income and expenditure analysis of Thatta

Summary of expenses per month in district Thatta								
Family size	**Food**	**Health**	**Clothing**	**Social events**	**Education**	**Transport**	**Communication**	**Total**
1-4	8,000	1,000	500	500	200	1,500	500	12,200
4-8	16,000	2000	1,000	800	400	1,800	1,000	23,000
8-16	22,000	3,000	1,800	1,200	700	2,000	1,500	32,200
16-22	28,000	3,500	2,000	1,500	1,000	2,000	1500	39,500

As discussed under table-A same is the case of district Thatta, however, average monthly expenditure and income of the district is different. Average family size of district Thatta is 7, and average monthly expenses of 7 family members is 17,000 PKR.

Livestock milk production is comparatively low in Thatta from Badin, whereas, agriculture and fishing income is a bit high as compare to Badin. Average income of people can be calculated as fishing+ livestock 9,000 PKR per month and agriculture+ livestock is 6,000 PKR per month. Overall, economic life is under income deficit, people have spent over for next generations, and economic prosperity is not possible until any long term livelihood enhancement strategies are not adopted.

4.7 Resource Card

Generally, there are three types of resources as discussed under wealth ranking; women usually do not own the productive assets. Some of the women own poultry and livestock that is also used by men community members in case of emergency. There are two things those can be owned these are agriculture and livestock, agriculture is completely owned by men and livestock is partially owned by women as well. Fishermen are usually daily workers; they do own anything, however they are allowed to fish for free in sweet and source water resources of Sindh. Fishing is only done by men members of community, whereas in agriculture and livestock there is labor share of women.

Generally, men members of community have control on all types of resources used by communities. Men members of community decide about how the resources shall be used, women have some decision power over milk production of livestock.

4.8 Daily Clock

Working hours for agriculture and livestock people are same almost; fisher folk usually work in days and nights in sea for fifteen days and take rest for one week at least. Working hours of government and private job holders are usually 5 to 8. Women of villages mostly work for more hours as compare to men because they have two types of jobs to do, household works and work for earning livelihood. Daily activities of community in general are detailed below:

a. Get up in morning

It was observed during daily clock exercise that rural people get up early in morning by 5:00 to 5:30 am. Women of communities prepare breakfast and tea, after that men community members except government or private employees move for work. First half of work starts from 6:00 am and continues till 12:00 pm. During lunch break, women of community prepare food and men take rest till 2:30 pm. Second half of work starts from 3:00 pm to 6:00. Dusk is the dinner time for communities, after dinner people use to sit in social gatherings and discuss about their personal life. People those have livestock at their homes, take a glass of milk before going to bed.

b. Working hours of male and female are different, female do work more than male when counted in hours. But, most part of the intense work is done by male members.

c. Food times

As discussed above, 6:00 am is the time for breakfast, 12:00 pm is lunch time and 6:30 pm is the time for dinner. Three times meal in a day is general custom of communities.

d. Social gatherings

After day long work people regardless of their occupation sit together and have gossips about what went in their lives during whole day. This gossip is very important part of the people get closer to each other during this time. All of the important matters of life such as, politics, livelihoods and everything about social life are discussed during these gatherings.

e. Sleeping hours

After social gathering from 7:30 to 9:00, people go to bed. People feel very exhausted after day long working and usually rest for seven hours from 10:00 pm to 5:00 am. People of rural communities sleep timely in night and wakeup early in the morning.

4.9 Focus Group Discussion

Focal Group Discussions (FGDs) was the final activity, the objective of conducting FGD with communities was cross validation and confirmation of data collected through other techniques (See fig 5 FGD). However, analysis of population dependency ratio and Venn diagram were also generated through FGDs which are given under.

Figure 4: FGD

4.9.1 Dependency ratio

Dependency ratio of communities is very high. 48% population is children of below 18 age, 2% are old age people and 26% are women, those all depend on 24% of youth men. Youth women of community are not considered as lead producers, because, fishing is generally done by men. In agriculture and livestock, lead role is played by men and

women are used as free or low charge daily labor. 100% of the adult women make handicrafts and embroidery but products are only for personal use. By exploring income options for handicrafts, the dependency ratio of population can easily be reduced from 76% to 50%. These 50% dependents will be old age people and children below 18.

For further understanding on dependency, refer the Figure 5. This chart gives complete age and gender structure with number of people at both districts in combine.

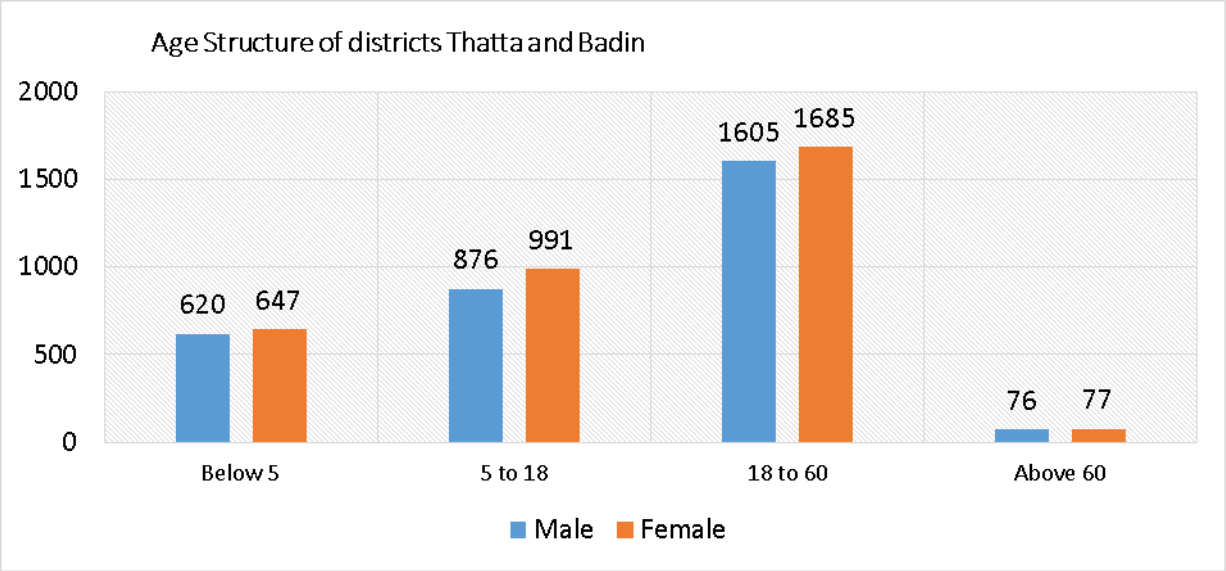

Figure 5: Demographic status of districts

4.10 Venn diagram

Venn diagram was generated during FGDs with male and female separately. It was found that NRSP, BRDS, SPO, PPAF, MDF, LHDP and other government organization have also worked in these villages on livelihoods development. However, currently NRSP is working in adjacent villages on WASH in both of the districts and NRM was found working in only one village of district Badin which is focusing on mother and child health. Five years ago there were few organizations worked in both of the districts on different projects, currently only PRCS has initiated the work in the selected villages.

Presently following Organizations are working the area:

1. Pakistan Red Crescent Society
2. National Rural Support Program
3. National Rural Management

Organizations worked in past five years:

- National Rural Support Program
- Sindh Agriculture and Forestry Workers Coordinating Organization (SAFWCO)

- Badin Rural Development Society
- Badin Research and Development Organization
- Strengthening Pakistan Organization
- Management & Development Foundation
- Laar Humanitarian and Development Programme
- Health And Nutrition Development Society
- Pakistan Fisher Folk Forum
- Peoples Primary Health care Initiative

5. PESTEL/SWOT analysis

Political, Economic, Social, Technological, Environmental, and Legal, Strength, Weakness, Opportunities and Threats, to primary livelihoods of both districts were measured to build context in which project is being implemented. This technique of data collection called PESTEL/SWOT analysis, this technique is mostly used during planning and/or during realistic evaluation of any project. The purpose of this exercise was to analyze strength, weakness, opportunities and threats of each important aspect of context such as political and economical to present primary livelihoods sources of districts. As the targeted area of both districts was the costal belt, so, the context and other findings will reflect the costal belt only. In both of the districts context of costal belt is same, only slight variation is in the weather calendar.

5.1 District Badin and Thatta

Political situation for fisheries is generally good all over the country, especially in Sindh province after efforts of Pakistan fisher folk forum. In Badin, the situation is most favorable, it is free zone for fishing, and fisherman marketing organizations are also available. For livestock and agriculture political atmosphere is not much favorable, however in political parties there are farmers' wings but those are not functional up to mark. There is no any political support to livestock and dairy market. There are many weaknesses in political situation but no such threat to any livelihood source. There is no any a strict rule or political disputes on fishing, agriculture or livestock. However, fare distribution of water is very difficult, landlord with political back of ruling party use to violate the irrigation water distribution in the both PRA areas of both districts. Resulting, small farmers in the both districts face water shortage at the cultivation time of various crops every year.

Awareness of communities at grassroots level along with introduction of alternate solutions to water shortage and linkages with market may support the small grower for more sustainable livelihoods. .

Economic situation is much supportive to the available livelihoods in the district. Involvement of middleman in market and monopoly of big merchants are the areas which feed for violation of the small growers. At local level, all the products of three primary livelihoods are bought from primary producers at very low rates. For example, primary owner sale milk at 30 PKR per KG which is sold at price of 80 PKR per KG in city market. Fishermen get 40 PKR per KG and in city market; fish is above 150 PKR per KG. Although policies are in place for the all mentioned livelihoods to support the primary producer but governance is the main issue. Fisher folks of sea cannot afford big boats and nets; they are bound to work for contractors. Nearly 25 people go for fishing on single boat and stay at least 15 to 20 days in sea and at the end earn only 6000 PKR per head. Whereas, the contractor earns 150,000 PKR.

There is lot of space to work on building laws for price control. All factories products are abide by rules of price controls, so, it is not impossible to develop price controls for livestock products and fisheries. There is room to work for balancing the role of middlemen in marketing. There is space to develop standard enumeration rules for fishermen working for contractors. Assistance to the groups of fisher folk in terms of boats and fishing nets along with linkages with market may increase options for the small fisher communities to get more part of the profit and be sustained.

Socially, agriculture and livestock is valued businesses. Farmers and livestock holders have reputable status in society. Whereas, fishing is social low caste work, but, in costal belt it is highly sustainable as compare to agriculture. but, almost every household keep livestock as a backup support and to keep them salves busy when half of male members of community stay in sea. Three of the primary livelihoods are very traditional in area. In terms of social ties, fisher folks are more united as compare to agriculture and livestock people. Due to unavailability of local market and problem of roads and other communication network to access city market, in case of more quantity milk and milk products are distributed for free in neighbor households.

There is space to work on building coordination forums of livestock and agriculture people. Infrastructure and communication networks can also be built to develop social stability. Livestock holders and agriculture communities need trainings in context of climate smart agriculture. Traditional methods of agriculture and livestock are not strong enough to face climate change.

Technologically, situation is favorable; vaccinations for livestock are available at city centers. Livestock doctors and clinics are easily available in cities. People living in far and remote villages face problem to access the medication facilities. Proper roads and local transport is not available which is creating access problems. People living in villages generally lack information about livestock diseases and treatment. Randomly

few literate persons are available in the villages who know about current practices of livestock and agriculture management. Due to lack of awareness, low quality medicines/agri inputs are being sold in market which is harmful to livestock and agriculture.

Awareness level of communities on best practices for coastal agriculture, livestock and fishing may support the communities to utilize properly the available resources and get more return from the available resources.

Environmental conditions are un-predictable, climate change has shown many effects on costal area. Due to four weathers, variety of crops can be cultivated in the area. As per seasonal calendar pattern of weather is also changing. Winter and spring seasons are decreased, summer is increased which is effecting fisheries and agriculture. Slight increase in the temperature has also been noted during a decade. Sweet water sources, ponds and lakes are decreasing, grazing lands for livestock and proper amount of water for agriculture is also decreasing. The drastic change in the cropping pattern and per acre yield is affected due to rear water flow downstream from Kotri barrage resulting, delta in Thatta is at risk.

Environmental awareness programs needs to be conducted. Climate smart agriculture, soil conservation technology, bio saline agriculture practices and modern practices in aquaculture fisheries needs to be introduced and adopted at grass root level for the socio-economic development of the community. Use of pesticides needs to be decreased and alternative natural treatment of crop diseases through integrated pest management practices needs to be introduced. Along with this, introduction of bio-saline agricultural practices may sustain the existing agriculture sector in the area.

Legally, situation is favorable to fisher folks in particular and all other livestock in general. There is no any restriction of laws for agriculture or livestock in the area, fishing is free any fisherman can get the license. But, there is no law for cutting of trees, especially mangrove trees. Mangroves are important in protection from sea storms and also provide shelter to many breads of fish. Thin fishing net (Bolo Rachh) is banned from government, but, enforcement of this law still needs to be ensured on ground.

There is space to work for the laws of use of agriculture water, laws for fixing price of livestock and milk or milk products. One can work on implementation of laws against use of small net for fishing. Laws to protect trees need to be reinforced. **S**upportive things in context, political situation for fisheries is generally good all over the country, especially in Sindh province, after efforts of Pakistan fisher folk forum. Market for agriculture, livestock and fisheries is available at local level. In all fishing households, women and at least one man of family remain at house, this man power can be used for alternative livelihoods. Three of the primary livelihoods are very

traditional in area. In terms of social ties, fisher folks are more united as compare to agriculture and livestock people. Vaccinations for livestock are available at city centers. Livestock doctors and clinics are easily available in cities. Due to fours weathers, variety of crops can be cultivated in area.

Hurdles in context. Increased magnitude of disasters (i.e. floods, drought and cyclone), low literacy level, low yields of agriculture and no proper exploration of dairy products/business along with low level of awareness of communities to cope the situations and diversify the livelihoods are the main hurdles for the sustainable development.

6. Conclusion

The conclusion drawn from the Participatory Rural Appraisal, study for the socio-economic and livelihood situation for the coastal community. The following three main sources of livelihood have been identified as given below:

A. Agriculture Sector

Agriculture, is most strong source of livelihood, communities not only get cash money from agriculture but also take food stock for the year. The following major crops are being cultivated by the community in the coastal belt of the study area as given below:

1. Wheat
2. Rice
3. Cotton
4. Sugarcane
5. Sunflower
6. Vegetables

The above crops are generally considered as a cash crop, however wheat is mostly used for food and simultaneously a little amount of rice as well. Moreover, the rice is being also sold to the rice factories and sunflower are being cultivated by the people as a source of cash crop as well as sugarcane is also being cultivated in the area but due to monopoly of the mill owners the farming community do not get the desired price of the sugarcane. Cotton is only cash crop which is harvested in July and August, it was found during seasonal calendar that frequent disasters, like, rain floods or heavy storm come during these months (July and August). Due to frequent rain/ floods in 2011, 2013 and 2015, cotton was the most affected crop in the area.

B. Livestock Sector

Livestock is the second stable livelihood source of the community residing the project villages. Climate change and weathers generally have not affected livestock. Usually

people do not own livestock as source of earning; produced milk is mostly used as household food. People earn from livestock when they sale it, on average one large animal is sold every year by each livestock family which may earn from 40,000 to 80,000. In both districts Thatta and Badin small livestock and poultry is always under threat of contiguous diseases due to water borne and as well as lack of livestock management practices and viral and bacterial and as well as nutrition deficiency. Livestock is secondary or supportive livelihood which is easy to manage by communities. It was suggested by all of the villages during PRA that livestock should be given as an alternative livelihood.

C. Fishing Sector

Fishing practice was also observed in all study villages. People used to fish in small ponds of fresh water and as well as surrounding wetlands and is being used for food and for sold in the local market. Fishing is business for the people those who caught the fish at larger level, especially in deep sea. In Badin, the people caught fish from nearby wetlands and lagoons connected with the sea, however in district Thatta fisher communities usually go to Karachi and use to fish as wage earners with the contractors. Dependency ratio of communities is very high. 48% are below 18 children, 2% are old age people and 26% are women, those all depend on 24% of youth men. Youth women of community are not considered as lead producers, because, fishing is generally done by men. In agriculture and livestock, lead role is played by men and women are used as free or low charge daily labor.

7. Recommendations

A. Agriculture sector:

- Introduction of climate smart agriculture activities with special focus on demonstrating how to reduce use of fuel water pump machines in order to reduce fuel consumption in the area.
- Training of communities on Best Agricultural Practices and Soil Conservation Practices: this will help to diversify the crops which are resistant to the salinity.
- Pilot research for exploration of saline tolerant crops and best practices: demonstration plots may be established to test cultivation and yield per acre for different crop varieties in order to explore more appropriate crops and varieties for the area.
- Formation of farmer cooperatives and farmers enterprise groups and building their capacity in the following areas:
    - Social Mobilization

  - Community Management Skills
  - Marketing Linkages
  - Small Scale Business Intervention
- The above trainings will lead the marketing opportunities in the area for the small growers. This will help to balance the role of middlemen and the more part of the profit margin may be moved to the small growers. Farmer cooperatives may be given endowment funds and the farm equipment to be utilized on subsidized costs for the cooperative members. This will help to reduce the cost of production.
- Provision of saline tolerant seeds and appropriate tools/ inputs to the small growers in order to utilize their land and get good yield per acre. This assistance may increase production of the small growers and their income level.
- Although cultivation of vegetable is common in the area however, application of chemical pesticide on larger scale in the area has created health hazards in the area. The same vegetables are consumed without treating it. Introduction of kitchen gardening models with training on how to grow chemical pesticide free vegetables may support in consumption of healthy and fresh vegetables in the area. This activity may support to increase the trend of consuming diversified and nutritious food in the area.
- Beside this farmers advisory services through establish of advisory centre to provide agriculture related knowledge through electronic and print media to the farming community.
- Weather forecasting and early warning centre should be establish to aware the community regarding the climate situation of the area.

B. Livestock sector:

- Livestock trainings as suggested below will help the community for their better livelihood and youth will be involved to establish animal health unit at the community level:
  - Community Livestock Extension Worker (Men and Women)
  - Fodder Preservation Technology (Men and Women)
  - Backyard Poultry Management (Men and Women)
  - Goat Rearing for Rural Youth (Men and Women)
- Distribution of small and large livestock to the families who have less livestock and capacity to rear the livestock. This will help in increasing the level of productive assets with those families on the one hand, whereas on

the other hand, it will support in increasing the food consumption scores of the poor families.

C. Fishery sector:

- Fisher folk shall be trained properly on Best practices on fishing, storage and marketing. Distribution of required inputs/ storage bins etc. for fishing will also be supportive for the fishing communities.
- Early warning system, farmers' advisory services and technology transfer is needed for aqua culture and fish improvement technology in the area.
- Advance knowledge is required for preservation of fish at local level.

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